

# Maternal awareness of neonatal hearing loss in Arar City, northern Saudi Arabia: A cross-sectional study

Neonatal hearing loss awareness in Arar

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## Abstract

**Aim:** The study aimed to assess the awareness and attitude of the mothers regarding neonatal hearing loss (NHL), its risk factors, and available detection and intervention choices.

**Material and Methods:** A cross-sectional study design will be conducted among mothers in the Maternity and Children Hospital in Arar, northern Saudi Arabia.

**Results:** A total of 200 mothers were included in the study, with a mean age  $35.5 \pm 10.1$  years. Most of the mothers were aware of risk factors for NHL such as middle ear infections (138, 69%) head trauma and/or ear slaps (134, 67%), family history (128, 64%). However, the participants were not aware of several other risk factors neonatal jaundice (32, 16%) and prematurity (49, 24.5%).

**Discussion:** The current study provides data on maternal knowledge and attitude of NHL in northern Saudi Arabia. There is insufficient knowledge regarding some risk factors such as maternal infection during pregnancy, neonatal jaundice, viral infection, head trauma and consanguineous marriages. The results show the maternal awareness gap that exists in the area.

## Keywords

Maternal Awareness, Attitude, Neonatal Hearing Loss, Risk Factors, Newborn Hearing Screening

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This study was approved by the Ethics Committee of Bioethics at Northern Border University (2023-09-03, No:72/44/H)

Introduction

Over 5% of people worldwide need rehabilitation to treat their incapacitating hearing loss. According to World Health Organization (WHO) 2023, more than 700 million individuals are predicted to have a debilitating hearing loss by 2050 (Available at: <https://www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss>). Congenital Hearing loss (HL) present at birth occurs when the ear's ability to convert the vibratory mechanical energy of sound into the electrical energy of nerve impulses is compromised [1].

In neonates, persistent unilateral and bilateral hearing loss worse than 40 dB is a common condition. The rate ranges from 1 to 6 per 1000 individuals and the prevalence rates in Asia are marginally higher than in Europe, but not significantly so [2]. This form of disability has a growing impact on individuals, families and communities as hearing difficulties can be life-altering. It is commonly known that mothers' knowledge of HL, its risk factors, and the options for early detection and management is crucial to the timely identification and treatment of HL [3]. According to the location where hearing loss is more common in rural areas, Saudi Arabia may have a varying prevalence of hearing loss. [4]. Many studies conducted in Saudi Arabia revealed varying rates of hearing loss, ranging from 1.75 to 7.12% [5, 6]. The distressing consequences of HL are more visible when it happens early in childhood than when it occurs in adults. Undiagnosed hearing loss can have detrimental effects on a child's social, linguistic, and speech development. Children with hearing loss will have better overall outcomes and the best chance to fulfill their full developmental potential if Early Detection and Hearing Intervention (EDHI) programs are implemented [7, 8].

Previous research indicates that mothers have a high level of knowledge regarding physical causes of hearing loss, such as head injuries, ear slaps, and ear discharge. Mothers' knowledge of neonatal jaundice, neonatal intensive care unit hospitalization (more than five days), symptoms of neural and late onset hearing loss, managing hearing loss, fitting hearing aids, and the need for therapy, on the other hand, was the least and could potentially impede the early detection and treatment of hearing loss [4, 5].

A previous study done in Saudi Arabia 2016, shows that the participants' children were diagnosed at a substantially late age, resulting in delayed ages for initial hearing aid fitting and enrolment in early intervention services [6]. Raising the general public's awareness of NHL should be an important goal. To close these knowledge gaps, more educational initiatives should be launched, with government institutions playing a crucial role [9]. Mothers' decisions to regularly screen their children for HL are very important. These decisions are made considering their understanding of and attitudes toward the factors that contribute to baby hearing loss, as well as their knowledge of treatment options. As no studies have been done in Arar City, northern Saudi Arabia, regarding knowledge and awareness of the NHL.

The study aimed to assess the awareness and attitude of the mothers regarding neonatal NHL, its risk factors, and available detection and intervention choices. Among Saudi mothers. Such awareness has been well known to play an essential role in the

early detection and intervention of hearing loss.

Material and Methods

Study setting and design

A cross-sectional study was performed between August 2023 and April 2024 among mothers attending Maternity and Children Hospital, Arar City, northern Saudi Arabia. The study targeted mothers aged 18 years or older who have recently given birth.

Sampling tool and methods: An adapted version of the structured questionnaire used by Olusanya et al. [10] in Arabic was utilized and distributed manually (a self-administered questionnaire) to the mothers in the postnatal ward to collect data in the presence of the researcher. Informed consent was obtained from all the participants before they completed the questionnaire. The participants were randomly selected using the systematic random method (every third mother). The questionnaire consisted of four sections,

1. The first section assessed the demographic characteristics of the participants, such as age, residence, consanguinity, and educational level.
2. The second section included questions related to NHL.
3. The 3rd one involved questions related to Maternal beliefs of non-biomedical causes and early identification of NHL.
4. The last section Maternal included questions related to awareness and attitude towards early intervention for NHL.

Pilot study

A pilot study involving 20 mothers was carried out to assess the questionnaire's clarity. Based on the results, the questionnaire was not modified. The result of the pilot study group was not included in the final study results.

Sample size: The sample size was determined by applying the subsequent formula:  $N = \frac{Z^2 \times p \times (1-p)}{d^2}$ , where N= sample size, Z= the statistic corresponding to confidence level (1.96), P = the Expected prevalence of awareness (15%) from previous stud[11] and d= Margin of error (0.05). The expected sample size was 196 and the sample completed at 200

Statistical analysis: The data were collected, entered, cleaned, and then analyzed using SPSS version 22 (IBM SPSS Statistics V22.0). Qualitative data were presented as frequency and percentage whereas numerical data were expressed as mean and standard deviation.

Inclusion criteria

The study considered mothers above 18 years, and who have recently given birth,

Exclusion criteria

Mothers who are less than 18 years

Ethical Approval

The study was approved by the local committee of Bioethics at Northern Border University (HAP-09-A-043), (Date: 2023-09-03, No: 72/44/H).

Results

A total of 200 mothers were included in the study, with a mean age of 35.5±10.1. They were divided into three age groups: more than forty years (71, 35.5%), less than thirty years (72, 36%), and 30-40 years (57, 28.5%); the majority were from the northern region (186, 93%), and less than forty

percent (75, 37.5%) are consanguineous marriages. Ninety-three percent (182) have a university education; the others have only a secondary or lower education. Table 1 illustrates maternal awareness of neonatal hearing loss risk factors. Most participants stated that babies can be born with hearing loss, more than half stated that hearing loss can be identified at birth. Slightly more than a quarter indicate maternal infection during pregnancy, self-medication of ototoxic drugs cited by 48% (96), early and late pregnancy recognized by 17.5% (35), forty percent mentioned consanguineous marriage, nearly two-thirds reported family history, and slightly more than 30% (63) indicated delayed birth cries. Neonatal jaundice is recorded by a small percentage (16%), approximately 25 percent recognize low birth weight and prematurity, mumps and measles are recorded by nearly one-third, and about two-thirds report a head injury or slab, and ear infection is stated by slightly less than 70% (138). Table 2 demonstrates maternal beliefs about

non-biomedical causes and the early identification of NHL. More than forty percent believed that magic spells and evil eyes can lead to NHL, the majority mentioned that screening for NHL and follow-up of the child is essential. More than 60% suspected hearing loss if the child abruptly became dull, withdrawn, mispronounced words, gave inconsistent responses to speech, and more than two-thirds answered that a child's inconsistent response to a name call and exhibited speech comprehension difficulties necessitated hearing testing. Table 3 shows maternal awareness of early intervention for neonatal hearing loss. Slightly more than forty percent mentioned that NHL can be treated at birth; the majority accepted their baby to wear a hearing aid; slightly less than sixty percent believed that training a child to speak better than sign language; more than two-thirds stated that if the NHL is diagnosed early, the child can learn the best possible speech and language skills; and about two-thirds reported that with early identification

Table 1. Maternal awareness of neonatal hearing loss risk factors

Items	Yes n (%)	No n (%)	I don't Know n (%)
Can babies be born with hearing loss	157 (78.5)	18 (9)	25 (12.5)
Can hearing loss be identified at birth	115 (57.5)	44 (22)	41(20.5)
Maternal infection (Rubella) during pregnancy causes neonatal HL.	53 (26.5)	37 (18.5)	110 (55)
NHL is caused by ototoxic medications during pregnancy.	96 (48)	19 (19.5)	85 (42.5)
Early and late pregnancy cause HL in a child	35 (17.5)	73 (36.5)	92 (46)
There is any relationship between HL and Consanguinity?	80 (40)	43 (21.5)	77 (38.5)
Family history of hearing loss cause HL	128 (64)	22 (11)	50 (25)
Delay in birth cry can cause HL	63 (31.5)	41(20.5)	96 (48)
There is relation between neonatal jaundice and HL	32 (16)	82 (41)	86 (43)
Prematurity, low birth weight, and more than 5 days of neonatal intensive care unit admission can cause HL?	49 (24.5)	56 (28)	95 (47.5)
Measles and/or mumps can cause HL	64 (32)	41 (21.5)	95 (47.5)
Head trauma and/or a slap to the ear cause HL	134 (67)	16 (8)	50 (25)
Middle ear infections can cause HL	138 (69)	14 (7)	48 (24)

Table 2. Maternal beliefs of non-biomedical causes and early identification of NHL

Items	Yes n (%)	No n (%)	I don't Know no (%)
Magic spells can cause hearing loss	89 (44.5)	33 (16.5)	78 (39)
Evil eyes can cause hearing loss	93 (46.5)	36 (18)	71 (35.5)
Hearing screening at birth is important?	163 (81.5)	12 (6)	25 (12.5)
A follow-up is necessary to monitor your child's progress after an HL test	151 (75.5)	18 (9)	31 (15.5)
An active child who is abruptly withdrawn and dull responded to speech inconsistently. There is suspicion about HL	126 (63)	20 (10)	54 (27)
Hearing tests are required when a child responds inconsistently to name calls and exhibits speech comprehension difficulties	152 (76)	10 (5)	38 (17)

Table 3. Maternal awareness and attitude towards early intervention for NHL

Items	Yes n (%)	No n (%)	I don't Know n (%)
NHL can be treated at birth	83 (41.5)	22 (11)	95 (47.5)
Would you allow your child to use a hearing aid from a young age?	148 (74)	22 (11)	30 (15)
Do you believe that teaching a child to speak is preferable to teaching them sign language?	118 (59)	23 (11.5)	59 (29.5)
Can the child acquire the best possible speech and language skills if he is recognized and treated early?	140 (70)	13 (6.5)	47 (23.5)
Can a child who has been diagnosed with HL and received early rehabilitation attend regular school?	133 (66.5)	15 (7.5)	52 (26)
Can a child interact with other hearing peers if they are recognized and treated at an early age?	145 (72.5)	15 (7.5)	40 (20)
Do you believe that regular school is a better fit for kids with hearing loss than special education?	64 (32)	40 (20)	56 (28)
Does a child learn their first word by the time they are one or one and a half years old?	126 (63)	26 (13)	48 (24)
Are there facilities provided by the government for an infant with hearing loss?	96 (48)	49 (24.5)	55 (27.5)

and rehabilitation, the child can attend normal school. More than 70% reported that early indentation helps the child communicate with peers; only one-third mentioned that regular school is suitable for children with HL. More than sixty percent answered that the child acquired the first word at 1 to 1.5 years old, and slightly less than half were aware of the facilities for hearing loss introduced by the government.

## Discussion

This study assessed maternal awareness and attitude regarding NHL, its risk factors, and available detection and intervention choices. Most participants mentioned that babies can be born with hearing loss, and slightly less than sixty percent stated that hearing loss can be identified at birth. In agreement with Almutairi et al., in Saudi Arabia (78.4%)[9], and Albesh et al., in the Gulf area (713, 90%), indicated that HL can be present at birth.[12]. However, in contrast to a United Arab Emirates study that only found (78%, 45%) [13].

Concerning risk factors for NHL, the study reveals that most of the mothers were aware of risk factors for NHL, such as head trauma (67%), ear infections (69%), maternal medication with ototoxic drugs (48%), and consanguinity (40%). Similarly, in a study in Saudi Arabia, Al-Yahya et al., found that most of the mothers (74.3%) and (78%) mentioned middle ear infections and head trauma/slaps on the ear were risk factors for NHL. On the other hand, less than one-fifth were identified as low birth weight, prematurity, delayed crying at birth, infection during pregnancy, neonatal intensive care unit admission, and high-grade fever as a risk factors for the disease [5].

Additionally, in their study, Almutairi et al., in Saudi Arabia, 63.4% of the subjects reported maternal infection during pregnancy, 55.7% had low birth weight, 47.1% had a family history, and 63.5 percent had prematurity [9].

In Syria, Hussein et al., found that, in that order, 67%, 36%, 66%, 46%, 25%, and 44% of the subjects stated high fever, measles, ear discharge, medications, jaundice, and delayed cry, respectively [3, 5]. A study in Uganda also noted that most of the participants were aware of the most common risk factors, such as the family history (61.6%) and measles (63.3%) [14]. Almazroua et al., in Saudi Arabia revealed that, in comparison to non-consanguineous marriages, the likelihood of having children with sensorineural hearing loss in a consanguineous marriage is 3.5 times higher [15].

Furthermore, a study in the United Arab Emirates noted that 38% reported high fever, 58% family history, and 42% consanguineous marriage [13]. The most cited risk factors in the same country, according to Albeshi et al., were middle ear infections (517, 65.4%), maternal infections (412, 52.1%), medicine prescriptions (352, 44.5%), late birth cries (175, 22.1%), measles infections (161, 20.4%), and neonatal jaundice (94, 11.9%) [12].

In South Africa, Govender and Khan reported that 81%, 78.4%, 57%, 54%, 34%, and 16% of the respondents mentioned middle ear infection, ototoxic drugs, family history, head trauma, family history, maternal infection, neonatal jaundice, and prematurity as risk factors for NHL, respectively [16].

In terms of maternal awareness and attitude towards early intervention for NHL, the study reveals that the majority of the respondents (163, 81.5) agreed that hearing screening at

birth is important, and follow-up is required to track the status (151,75.5%).

In consistence with this finding, a study in Syria noted that ninety-eight percent of the mothers expressed support for early detection, and 97% agreed to wear hearing aid [3]. Also, a study conducted in Nigeria revealed that (88%) of the participants accepted universal neonatal hearing screening. [17].

Further, according to the study findings, (74%) of the participants stated that they would let their children wear a hearing aid from an early age; (59%) believed that teaching a child to speak is preferable to teaching them sign language; (70%) agreed that early identification of NHL can help the child achieve optimum speech; and (66.5%) believed that the child would be able to attend regular school and interact with their peers (72.5%). A substantial portion (70%) concurred that a child can fully develop their speech and language if they are identified and rehabilitated at a young age. In addition, 63% of mothers knew that by the time a child was one to one and a half years old, they usually learned their first words. However, 40% chose a special school, and (83, 41.5%) thought there was a treatment available for hearing loss that existed from birth. Finally, slightly less than half (96, 48%) knew of the government-run facilities for babies with HL.

According to research conducted in Saudi Arabia by Almutairi et al., found that the majority of the participants agreed to test their babies immediately after birth (91.7%), and to wear hearing aids (94.6%) [9].

In agreement with Elbeltagy et al., in Egypt, they found that (88.8%), (99.5%), (90.1%), and (48.4%) of the study participants have good attitudes towards a child wearing a hearing aid, neonatal hearing screening, and overall knowledge of neonatal screening, respectively. Also, the majority(90%) mentioned that there is a relationship between language, acquisition, and hearing [18]. In the United Arab Emirates study, it was noted that among the subjects, a substantial proportion had a positive attitude towards hearing tests at birth (89%) and wearing hearing aids (90%). The participants had poor knowledge regarding the prevention of hearing loss among infants. However, a substantial number were aware of the most common intervention methods [13]. According to a study done in Egypt, the majority of mothers (82%) had a positive attitude about hearing screening tests, and nearly two-thirds (65.4%) knew enough about them [19]. A survey conducted by Olusanya et al., in Nigeria and Ravi et al., in India found that the majority of mothers (84% and 54%) were generally accepting of their children wearing hearing aids [20, 21].

According to Albeshi et al., in United Arab Emirates, 592 (74.8%) participants knew that there was therapy for NHL, (485, 61.3%) that HL can be identified at birth, (515, 65.1%), and that children with hearing loss can have the same opportunities in school as children with normal hearing [12].

Malas et al., in Saudi Arabia found that, even among some pediatric physicians, some expressed uncertainty about whether to refer a newborn with hearing loss to an otolaryngologist [22]. This implies generally that there is insufficient knowledge regarding HL intervention among the participants.

## Limitation

The current research has two limitations. The first is the descriptive nature of the design, which is unable to detect a

cause-and-outcome relationship. The second is the selection bias because only mothers who agreed to participate in the study were contacted; mothers who had difficulty writing or reading also declined to participate in the survey.

Conclusion

The current study provides data on maternal knowledge and attitudes of NHL in northern Saudi Arabia. There is insufficient knowledge regarding some risk factors such as maternal infection during pregnancy, neonatal jaundice, viral infection, and head trauma and consanguineous marriages. The results show the maternal awareness gap that exists in the area. Thus, efforts must be initiated to increase mothers' knowledge of NHL risk factor for early detection, and intervention. Investigating the moms in other neighboring Saudi Arabian regions and thoroughly examining the current findings are necessary.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and Human Rights Statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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